The Olentangy River Wetland Research Park: Progress Report for 2004

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Summary

This publication offers the thirteenth consecutive annual report on teaching, research, service, and development at the Olentangy River Wetland Research Park (ORWRP). It covers progress in calendar year 2004, the eleventh year of hydrologic operation of the two 2.5-acre experimental wetland "kidneys" on the site, the eighth year of ecological development of our 7-acre mitigation wetland "billabong," the sixth year of the Sandefur Wetland Pavilion, and the second year of occupancy of the Heffner Wetland Research and Education Building.

Forty-one courses from 7 OSU Colleges (FAES, MAPS, ENG, BIO, SBS, VETMED, EDU) and several other institutions used the ORWRP in 2004 for college courses. One master's degree and one Ph.D. in wetland ecology were completed in 2004, raising the total number of theses and dissertations completed at the ORWRP to 44. Three short courses on wetland and river restoration and wetland delineation were taught in 2004 to 45 participants from 17 states/provinces. One hundred and sixty tours or presentations of the ORWRP were given in 2004 to 2300 participants as public outreach. Several invited lecturers presented seminars in 2004, including 2 Moonlight on the Marsh lectures.

Grants and contracts totaling $1.0 million were active at the ORWRP in 2004, including research on hydrologic pulsing effects on water quality improvement in wetlands and research on restoration of the Mississippi River Basin to save the Gulf of Mexico. Almost $1,700,000 in donations were secured in 2004, with the bulk of that amount from the estate of Wilma H Schiermeier to endow operation of the Heffner Wetland Building. The direct economic impact of the ORWRP to The Ohio State University in income from grants, contracts, development, and short course fees over its 13-year history: $7.2 million. Its contribution to wetland management and education of the public and students alike on restoration and protection of wetlands and rivers in Ohio and the country: priceless.

Why a Wetland Research Park?

Wetlands are shallow to intermittently flooded ecosystems that are more commonly known by such terms as swamps, bogs, marshes, and sedge meadows. They are revered as important parts of the natural landscape because of their functions in cleaning and retaining water naturally, preventing floods, and providing a habitat and food source for a wide variety of plant and animal species. It is estimated that more than half of the original wetlands in the lower 48 states have been lost to drainage projects and human development projects. Ohio has lost about 90 percent of its original wetlands.

When we lose wetlands, we lose their ability to provide clean water, prevent floods, and enhance biological diversity. Many organizations are calling for construction of new wetlands to clean up our streams, rivers, and lakes. The National Academy of Sciences has called for the restoration and creation of 10 million acres of wetlands in the United States by the year 2010. Five million acres of wetlands in the Mississippi River Basin have been suggested as being necessary to help prevent the dead zone, or hypoxia, in the Gulf of Mexico (Mitsch et al. 2001; Mississippi River Basin Task Force 2001). The U.S. Army Corps of Engineers oversees a regulatory program that results in tens of thousands of acres of wetlands being restored and created each year to replace wetlands that are lost to development. Furthermore, the largest wetland and riverine restorations in the world, at costs that will exceed $20 billion, are underway or planned for the Everglades and Louisiana Delta. But a National Academy of Sciences panel (NRC 2001) determined that much more research is needed before we can be assured that mitigation wetlands, those wetlands that are constructed to replace wetlands destroyed for development, can be successful. In order to solve such problems we need to know: 1) how wetlands work; 2) if we can create and restore them; and 3) the best approaches to creation and restoration of wetlands. The Olentangy River Wetland Research Park is designed to be a long-term, large-scale wetland research facility on a major college campus. There is no other facility of its kind on any other campus in the USA.

Progress at OSU's Wetland Site

The Olentangy River Wetland Research Park is located on a 30-acre site owned by the Ohio State University, immediately north of Dodridge Road and adjacent to the Columbus campus (Figures 1 and 2). The site has been developed in three phases:

Phase 1 — Construction of two experimental wetland basins and their water delivery system;

Phase 2—Development of a research and teaching

Figure 1. Aerial photograph of Olentangy River Wetland Research Park, Ohio State University, August 2004.

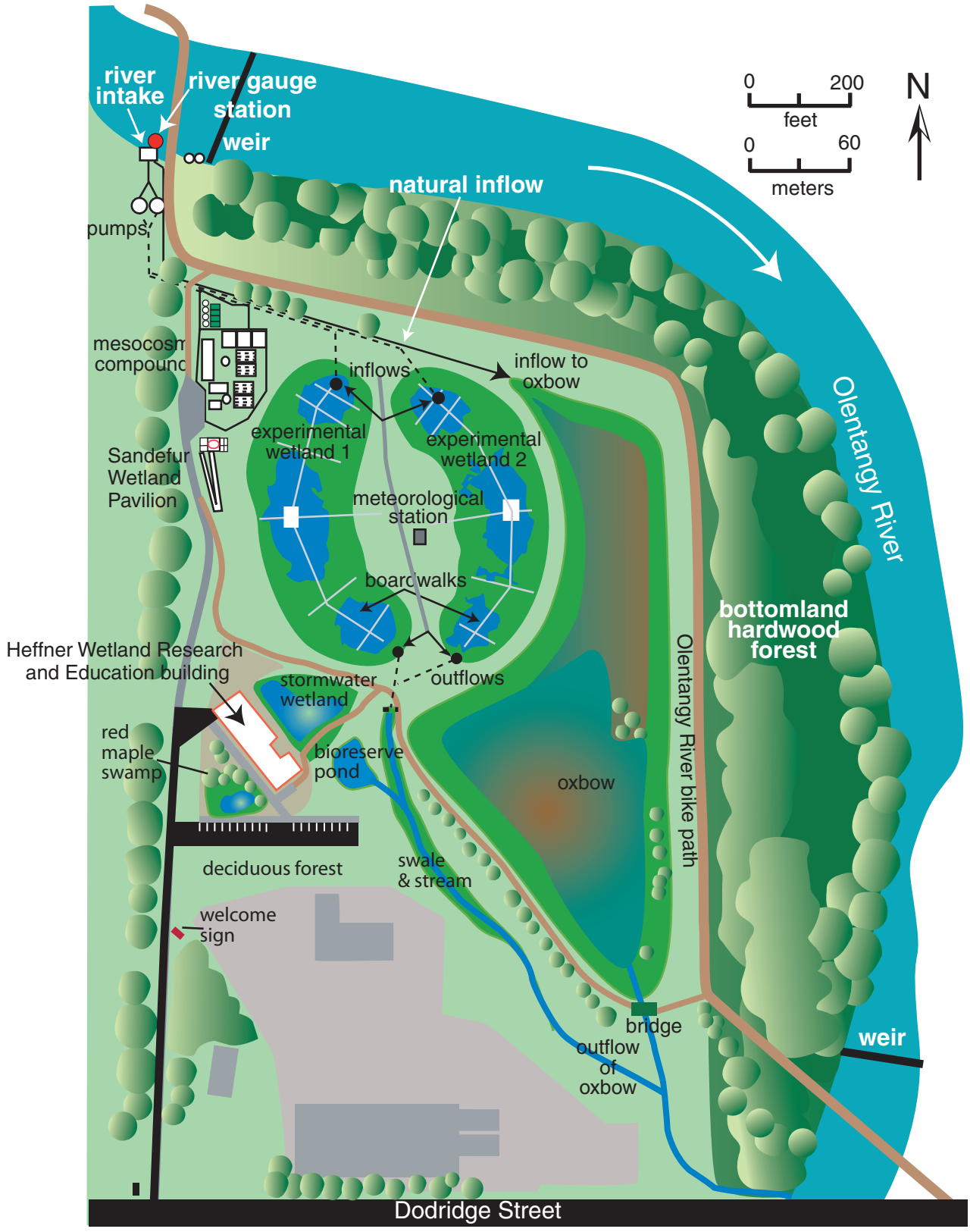

Figure 2. Olentangy River Wetland Research Park, 2004.

infrastructure at the site, including boardwalks, experimental mesocosms, a plant-material greenhouse, additional wetlands, instrumentation for long-term research, and a visitor pavilion; and

Phase 3 — Development and construction of the Wetland Research and Education Building on the site.

Phase 1 of site development, which featured construction of two 2.5-acre deepwater marshes and a river water delivery system, was completed in 1994. Pumps were installed on the floodplain to bring water from the Olentangy River to the wetlands and pumping officially began on March 4, 1994. River water is pumped continuously, day and night, into the two wetlands. It then flows by gravity back to the Olentangy River through a swale and constructed stream system. In May 1994, one wetland basin was planted with marsh vegetation typical of wetlands in the Midwest; the other remained as an unplanted control.

Phase 2, establishing the infrastructure for research and education of the site, began in 1994 and was completed with the dedication of the Sandefur Wetland Pavilion in 1999.

Phase 3, the construction of the $2.8 million Wetland Research and Education Building at the ORWRP, began with the receipt of $1.18 million in 2 grants from the Ohio Board of Regents in 1999 and 2000 in their Hayes Investment Fund competition. The grants were the result of an effort of a 5-university consortium of Ohio institutions — Ohio State, Wright State, Shawnee State, Youngstown State, and Kenyon College. Additional support for the building was obtained through donations, pledges, and a loan from OARDC. The decision to go forward with building construction was made on December 13, 2001. Construction began in spring 2002 and was mostly completed except for some interior work by March 2003. Staff and students began moving into the building on March 6, 2003.

Teaching, Research, and Service

Teaching

Teaching in a "living laboratory" setting has been an emphasis at the Olentangy River Wetland Research Park since its inception. From the time that a Natural Resources graduate seminar class in 1991 helped to design the project, dozens of formal courses involving thousands of students have used the site annually for ecological or other learning related to wetlands, surrounding uplands or the river. These formal courses have included classes on wetland ecology, water quality, ecological engineering, anthropology, architecture, general chemistry, wildlife management, animal ecology, groundwater hydrology, geography, ornithology, and forestry. Forty-one courses involving 770 students formally used the site in 2004 (Table 1), a considerable increase from 400 students in 24 courses in 2003. Classes were from 7 OSU Colleges (Food, Agricultural, and Environmental Sciences; Biology; Engineering; Math and Physical Sciences; Education; Veterinary Medicine; Social and Behavioral Sciences). Classes from Columbus State and Capital University also used the wetlands for field trips in 2004. A total of 44 students have completed dissertations, master's theses, or honors undergraduate theses with partial or full use of the Olentangy River Wetland Research Park from 1992 through 2004 (Table 2). One master's thesis and one Ph.D. were completed in 2004. While most students writing theses are from Ohio State departments, there have been five students from Europe (two from UK, three from Denmark) who collected thesis data at the ORWRP.

Research

Over $1.0 million in contracts and grants were active at the ORWRP in 2004 (Table 3). The projects included FGD coal combustion product recycling project (Ohio Department of Development, Bill Wolfe, PI), bottomland hardwood forest restoration (Ohio Department of Transportation, Mitsch, PI), and wetland pulsing (U.S.D.A., Mitsch and Frank Schwartz, PI's). Two grants totaling $1,118,000 from the Ohio Board of Regents for the Wetland Research and Education Building at the Olentangy River Wetland Research Park were completed at the end of 2003. The most significant grant involving research on the ORWRP wetlands themselves was for a hydrologic pulsing study supported by the U.S. Department of Agriculture NRI program. The two experimental wetlands were subjected to hydrologic pulses in the winter/spring of 2004. Preliminary results of that research are included in the 2004 annual report (Mitsch et al., 2005).

ORWRP scientists participated in a workshop at Louisiana State University in Baton Rouge on March 17, 2004, entitled "Ecological Restoration of the Mississippi-Ohio-Missouri (MOM) Basin: Identifying Research Needs" (Figure 3). The two-day event, sponsored by the Louisiana State University, Ohio State University, Louisiana Department of Natural Resources, and the U.S. Army Corps of Engineers, was the second OSU/LSU collaborative workshop on solving Mississippi River basin water quality problems such as nutrient over-enrichment in the Gulf of Mexico. The workshop was attended by over 100 participants, most from Louisiana and the lower Mississippi River Basin.

Public Outreach

The ORWRP sponsored several significant public activities in 2004. On May 22, 2004, a "Marsh-mellow" and building-naming catered event was held at the ORWRP for 100 friends of the wetlands; presentations were given by President Karen Holbrook, Provost Barbara Snyder, Vice-President Bobby Moser, and ORW Chair Jerry Pausch (Figure 4). The celebration was for the formal naming of the Heffner Wetland Research and Education building and major guests included Bill and Kristin Heffner from the Heffner Foundation, the major private support for the building. The marsh-mellow event was so named because of a Jimmy Buffet concert being held at Ohio State University later that evening.

Several distinguished scientists gave presentations for the Olentangy River Wetland Research Park in

Table 1. Formal class use of Olentangy River Wetland Research Park, 2004.

Term	Course	Number of students	Instructor and College
Winter 2004	Chemistry 221 General Chemistry	40	Susan Olesik MAPS
	Civil Engineering 817 Applied Mathematical Ecology	6	Bob Sykes ENG
	NR 797B Wetland and River Restoration	12	William Mitsch FAES
	NR 693 Independent Research-ORW projects	3	William Mitsch FAES
	Entomology 102 Insect Biology II	15	Dave Horn BIOL
	ES/NR 999 Independent Research	9	William Mitsch FAES
	Geol Sci 999 Independent Research	1	Frank Schwartz MAPS
Spring 2004	EEOB 322 Introduction to Ornithology	86	John Condit BIOL
	NR 662 Wildlife Ecology Methods	35	David Gates FAES
	Vet Medicine VMC 700.08	26	Cliff Monahan VETSCI
	EEOB 210 Local Flora	42	Elizabeth Harris BIOL
	LARCH 323	8	Brooks Breeden ENG
	LARCH 622 Landscape Architecture	38	Brooks Breeden ENG
	Environmental Geography 201	60	Bryan Mark MAPS
	Geography H294 Global Climate	10	Ellen Mosely-Thompson SBS
	FABE 724 Design Class	10	Martin FAES
	Biology 127 Environmental Science (Columbus State)	9	Indra Sindlen
	ES/NR 999 Independent Research	9	William Mitsch FAES
	Geol Sci 999 Independent Research	1	Frank Schwartz MAPS
Summer 2004	ES/NR 999 Independent Research	9	William Mitsch FAES
	EEOB 210 Native Flora	15	Liz Harris BIOL
	Vet Medicine 700.08	12	Cliff Monahan VETSC
	Vet Medicine 700.05	12	Cliff Monahan VETSC
	OSU- Science Education	6	Dr Thompson EDU
	Geography 210 Physical Geography	30	unknown SBS
	SNR Orientation	10	unknown FAES
	Introduction to Biology	10	unknown BIOL
	Geol Sci 999 Independent Research	1	Frank Schwartz MAPS
Autumn 2004	Vet Medicine 700.08	12	Cliff Monahan VETSCI
	Ecology (Capital University)	10	
	NR 725 Wetland Ecology and Management	33	William Mitsch FAES
	NR 626 Fisheries Technique	7	Lance Williams FAES
	EEOB 661 Conservation Biology	60	John D. Harder BIOL
	FAES 100T Natural Resources Survey	26	Mark Giese FAES
	EDU/TNL 894	20	unknown EDU
	Environmental Technology Science (Columbus State)	6	Mort Javadi
	NR 662 Wildlife Ecology Methods	40	David Gates FAES
	EMSI 221 Honors Chemistry Quantitative Analysis	15	Susan Olesik MAPS
	Geol Sci 999 Independent Research	1	Frank Schwartz MAPS
	ES/NR 999 Independent Research	9	William Mitsch FAES
	NR 893 Independent Study	6	William Mitsch FAES
	total number of students	770	
	number of courses	41	
	number of OSU colleges	7	

Table 2. Theses and dissertations completed at the Olentangy River Wetland Research Park through 2004.

Ph.D. dissertations (11)

- **Deni Porej** "Faunal aspects of wetland creation and restoration" Ph.D. dissertation, Evolution, Ecology, and Organismal Biology (2004)
- **Changwoo Ahn** "Ecological engineering of wetlands with a recycled coal combustion byprooduct" Ph.D. dissertation, Environmental Science Graduate Program (2001)
- **John J. Gutrich** "Ecological and economic analysis of natural capital: Assessing and modeling the substitutability of mitigation wetlands for natural sites" Ph.D. dissertation, Department of Agricultural, Environmental, and Developmental Economics (2000)
- **Michael A. Liptak** "Water column productivity, calcite precipitation, and phosphorus dynamics in freshwater marshes" Environmental Science Graduate Program (2000)
- **John J. Gutrich** "Ecological and economic analysis of natural capital: Assessing and modeling the substitutability of mitigation wetlands for natural sites" Environmental Science Graduate Program (2000)
- **Douglas J. Spieles** "Nutrient retention and macroinvertebrate community structure in constructed wetlands receiving wastewater and river water" Environmental Science Graduate Program (1998)
- **Randall J.F. Bruins** "Modeling of flooding response and ecological engineering in an agricultural wetland region of Central China" Environmental Science Graduate Program (1997)
- **Neal E. Flanagan** "Comparing ecosystem structure and function of constructed and naturally occurring wetlands: Empirical field indicators and theoretical indices" Environmental Science Graduate Program (1997)
- **Robert W. Nairn** "Biogeochemistry of newly created riparian wetlands: evaluation of water quality changes and soil development" Environmental Science Graduate Program (1996)
- **Naiming Wang** "Modelling phosphorus retention in freshwater wetlands" Environmental Science Program (1996)
- **Paul E. Weihe** "Colonizing and introduced vegetation in created riparian wetlands: Establishment during the first two growing seasons" Environmental Science Graduate Program (1996)

Master's theses (18)

- **Eric Lohan** "A methodology to ecologically engineer watersheds for nitrogen nonpoint source pollution control" Environmental Science Graduate Program (2004)
- **Mark Dilly** "Atrazine fate in a created wetland" Environmental Science Graduate Program (2003)
- **Sarena M. Selbo** "Hybridization between native and introduced populations of cattail and big bluestem: Conservation implications, Evolution, Ecology, and Organismal Biology (2002)
- **Cheri Higgins** "Ecosystem engineering by muskrats (*Ondatra zibethicus*) in created freshwater marshes" Environmental Science Graduate Program (2002)
- **Amie M. Gifford** "The effect of macrophyte planting on amphibian and fish community use of two created wetland ecosystems in central Ohio" Environmental Science Graduate Program (2002)
- **Daniel F. Fink** "Efficacy of a newly created wetland at reducing nutrient loads from agricultural runoff" Environmental Science Graduate Program (2001)
- **Matthew Cochran** "Effect of hydrology on bottomland hardwood forest productivity in central Ohio (USA)" Natural Resources (2001)
- **Sarah K. Harter** "Patterns of short-term sedimentation in a freshwater created marsh" Natural Resources (1999)
- **Sharon A. Johnson** "Effects of hydrology and plant introduction on first-year macrophyte growth in a newly created wetland" Natural Resources (1998)
- **Lisa J. Svengsouk** "First-year response of *Typha latifolia* L. and *Schoenoplectus tabernaemontani* (K.C. Gmel.) Palla to nitrogen and phosphorus additions in experimental mesocosms" Environmental Science Graduate Program (1998)
- **Kathleen D. Metzger** "Self-design of a fish community in a created riparian freshwater marsh: A simulation model" Environmental Science Graduate Program (1997)
- **John S. Koreny** "Hydrology of a constructed riparian wetland system: Characterization and predictive modeling" Environmental Science Graduate Program (1996)
- **Uygar Özesmi** "A spatial habitat model for the marsh-breeding red-wing blackbird (*Agelaius phoeniceus*) in coastal Lake Erie wetlands" Environmental Science Graduate Program (1996)
- **Doreen M. Dudek** "Tree growth responses to streamflow in a bottomland forest in central Ohio" Natural Resources (1995)
- **Steven F. Niswander** "Functional analysis of a created in-stream mitigation wetland: hydrology, phosphorus retention, and tree growth" Natural Resources (1994)
- **Renée F. Wilson** "Progress and success of five mitigation wetlands in Ohio" Natural Resources (1995)
- **Karen M. Wise** "Evaluation of acid mine drainage control by a constructed wetland in southeastern Ohio" Natural Resources (1994)
- **Frank D. Voss** "Groundwater investigation of Ohio State University wetland site" Geodetic Science (1993)

Undergraduate honors theses (10)

- **Katherine E. Kleber** "Fish population and movement within planted and naturally colonizing experimental wetlands, autumn 2000" Natural Resources (2000)

- **Erika A. Filippi** "The role of soil organic matter on denitrification potential in newly created wetlands" Natural Resources (1998)
- **Bonnie F. Elfritz** "A comparison of natural wetlands with a constructed wetland using the Floristic Quality Assessment Index" Natural Resources (1998)
- **Kimberly K. Schamp** "Groundwater patterns before and after wetland construction at the Olentangy River Wetland Research Park" Natural Resources (1997)
- **Nicole L. Vorwerk** "Comparison of three years of pH values between planted and unplanted wetlands at the Olentangy River Wetland Research Park" Natural Resources (1997)
- **Rainie D. Gardner** "Fish recruitment in the Olentangy River constructed wetlands" Natural Resources (1997)
- **Tonya Cheek** "Effect of fish on wetland water quality" Natural Resources (1996)
- **Andrew W. Wehr** "Early water quality of created wetlands at the Olentangy River Wetland Research Park" Natural Resources (1995)
- **Michael E. Berkal** "Hydrology and water chemistry of the Olentangy River in Worthington (Franklin County), Ohio, and their potential effects on a future constructed wetlands facility downstream in Columbus, Ohio" Natural Resources (1992)
- **Douglas G. Stuart** "Intensive water quality sampling in two constructed riparian wetlands" Natural Resources (1992)

Theses at other universities (5)

- **Rikki Bronnum** "The effects of alachlor on denitrifying bacteria in mesocosms and created wetlands in central Ohio, USA" Master's Thesis, Environmental Chemistry, University of Copenhagen (2001)
- **Hojeong Kang** "The significance of enzyme activities in wetland biogeochemistry" University of Wales, UK (1999)
- **Pernille Mortensen** and **Pernille Lanzky** "Water quality improvement in a constructed wetland" Thesis, Royal Danish School of Pharmacy, Copenhagen, DENMARK (1996)
- **Rebecca Smith** "Nitrogen transfer in groundwater in the riparian zone of the Olentangy River, Columbus, Ohio" Thesis, Cambridge University, Cambridge, England, UK (1996)

Figure 3. Organizers and key participants in Ecological Restoration of the Mississippi-Ohio-Missouri (MOM) Basin workshop held at the School of Coast and Environment at Louisiana State University, Baton Rouge, Louisiana on March 17-18, 2004.

Table 3. Funded research projects active at the Olentangy River Wetland Research Park in 2004.

RF #	Short title	Funding Source	College	Amount	end date
	Control Agricultural Runoff of Nitrogen	Payne Ag Ecosystems	FAES/MAPS	$145,000	6/30/04
744736	Restoration of Mississippi River Basin	Louisiana State University	FAES	$94,000	6/30/04
745333	Importance of hydrologic pulsing	USDA	FAES/MAPS	$272,000	8/31/06
738587	Wetland monitoring and management	Ohio Dept of Transportation	FAES	$75,000	5/4/06
738869	Reuse of clean coal FGD material	Ohio Dept of Development	ENG/FAES	$544,000	6/30/04
739039	Reuse of clean coal FGD material (suppl.)	West Virginia University	ENG	$25,000	6/30/04

Figure 4. “Marsh-Mellow” celebration held at the Olentangy River Wetland Research Park, May 22, 2004 to celebrate the naming of the Heffner Wetland Research and Education Building. Top, distinguished guests including, left to right, Bobby Moser, Dean of Agricultural Administration; Gary Mullins, Director, School of Natural Resources; Bill Mitsch, Director, ORWRP; Ruth Smart; Kristin Heffner; Provost Barbara Snyder; Bill Heffner; Jerry Pausch, Chair, ORW Advisory Committee. Bottom: OSU President Karen Holbrook addresses the 100 guests in the Heffner building lobby.

Figure 5. Moonlight on the Marsh lecturer John Teal (second from right) on May 11, 2004 prior to lecture. From left to right, Bill Mitsch, Director, ORWRP, Mohan Wali, School of Natural Resources lecture coordinator, Susan Peterson, John Teal, and Jerry Pausch, Chair, ORW Advisory Committee.

2005. In a pair of seminars on Ecological Indicators of Environmental Health held on January 22-23, 2004, at the Heffner Wetland Building, invited speakers Lucinda Johnson, from University of Minnesota, Duluth, presented "Development of Environmental Indicators of condition, integrity, and sustainability in the Great Lakes Basin" and Marius Brouwer, University of Southern Mississippi, presented "Molecular, organismal and spectral indicators of estuarine condition,"

Two "Moonlight on the Marsh" invited lectures were held at the ORWRP in 2004. Noted coastal ecologist John Teal presented "Large-scale successful salt marsh restoration in Delaware Bay" in Kottman Hall on May 13, 2004, in a seminar cosponsored by OSU's School of Natural Resources (Figure 5). Margaret Greenway, Griffith University, Brisbane, Australia, presented "Marshes and mosquitoes: Minimizing the potential problem in constructed wetlands in Australia" on July 12, 2004, at the Sandefur Wetland Pavilion at the ORWRP (Figure 6). The Greenway seminar was preceded by a "picnic at the swamp" event open to the public (Figure 7).

Wetland Tours

Formal tours and presentations of the ORWRP continued to be among our popular public service activities in 2004 (Figure 8 and 9). The ORWRP conducted 160 tours and/or public presentations on the Olentangy River Wetland Research Park in 2004 to over 2300 participants (Table 4). Groups receiving tours ranged from 14 ECLIPSE classes from Columbus Public Schools to two OSU Take a Daughter to Work Day tours. Over the past decade, the ORWRP has led over 900 wetland tours and presentations to almost 19,000 individuals (Figure 10).

Several distinguished scientists visited the wetlands in 2004 including: Lucinda Johnson, University of Minnesota; Marius Brouwer, University of Southern Mississippi; John Day, Louisiana State University, John Teal and Susan Peterson, Teal Ltd., Rochester, MA; Bob Knight, Wetland Solutions, Gainesville, FL; David Kovacic, University of Illinois; Margaret Greenway, Griffith University, Brisbane, Australia; New York artists Alexix Rockman and Mierle Laderman Ukeles; Allan Crowe, National Water Research Institute, Burlington, Ontario; Peter Loucks, Cornell University; Bill Marcuson, Army Engineers Waterway Experiment Station, Vicksburg, MS; Gary Pierzynski, Kansas State University; Joel Gat, Weizman Institute of Science, Israel; and Marshall Eames, DePaul University, Chicago. Yvonne Baskin, a noted science writer from Bozeman Montana, spent several weeks as a visitor at the ORWRP to gather data for her subsequent book "Under Ground: How Creatures of Mud and Dirt Shape Our World" (Island Press, 2005).

Figure 6. Moonlight on the Marsh distinguished lecture by Margaret Greenway, School of Environmental Engineering, Griffith University, Brisbane, Australia held at the Olentangy River Wetland Research Park, July 12, 2004. Top: lecture at Sandefur Wetland Pavilion; bottom: Jerry Pausch, Chair, ORW Advisory Committee, presents Moonlight on the Marsh plaque to Dr. Greenway.

Figure 7. “Picnic at the Swamp” that preceded the Greenway Moonlight on the Marsh lecture, July 12, 2004.

Figure 8. Over 160 tours and presentations were made of the Olentangy River Wetland Research Park in 2004 (see Table 4).

Figure 9. Tours of the Olentangy River Wetland Research Park take advantage of the boardwalk system in the experimental wetlands (top) and the YSI Data Control Center in the lobby of the Heffner Wetland Building (bottom).

Table 4. Tours and presentations of the Olentangy River Wetland Research Park in 2004

Date	note	Organization	Est. #
1/8/04	*	Justin Prindle	2
1/12/04	*	Alayne Parsons, Academic Affairs	1
1/14/04	*	Bas Straub, Publishing Editor, Elsevier	1
1/16/04	*	Beth Swinehart, potential student	1
1/22/04	**	Lucinda Johnson, University of Minnesota, Duluth	1
1/23/04	**	Marius Brouwer, University of Southern Mississippi	1
1/27/04	**	Steve Slack, Director, OARDC	1
1/28/04		Caroline Logan, St. Agatha School	2
3/1/04	*	Cub Scouts with John Igel	10
3/2/04		Entimology 102	15
3/7/04		Linworth School	13
4/3/04	*	Vet Medicine VMC 700.08 Cliff Monahan	14
4/8/04	*	Lora Aldag, Harambee Christian School	15
4/13/04	*	EEOB 322 Introduction to Ornithology	20
4/13/04	*	NR 662 Wildlife Ecology Methods	35
4/14/04	*	EEOB 322 Introduction to Ornithology	20
4/15/04	*	EEOB 322 Introduction to Ornithology	20
4/15/04	*	Dr Byran Mark and his TA (OSU Dept Geography)	2
4/16/04	*	Whittier Partnership: Kelly Coffman, Whittier Peninsula; Laura Busby, Audubon	3
4/16/04	*	Ohio Wildlife Center, FABE 724, Julia Valigore	10
4/16/04	*	Gary “Swampy” Hahn, Lexington, Kentucky	1
4/17/04	*	Ohio Center for Wetland and River Restoration Annual Meeting	10
4/19/04	*	EEOB 210 Local Flora Elizabeth Harris	7
4/19/04	*	EEOB 210 Local Flora Elizabeth Harris	20
4/20/04	*	American Language Prog. International Grads	16
4/21/04	*	Agri. Ambassador term	20
4/22/04	*	OSU Take A Daughter to Work Day	36
4/22/04	*	OSU Take A Daughter to Work Day	40
4/26/04	*	ECLIPSE classes, Columbus Public School	22
4/26/04	*	ECLIPSE classes, Columbus Public School	22
4/27/04	*	ECLIPSE classes, Columbus Public School	22
4/27/04	*	ECLIPSE classes, Columbus Public School	22
4/27/04	*	Jean Bingham and “Women Today”	15
4/29/04	*	ECLIPSE classes, Columbus Public School	22
4/29/04	*	ECLIPSE classes, Columbus Public School	22
4/29/04	*	Environmental Sciences Biology 127 - Columbus State, Indra Raw Sindlen	9
4/30/04	*	Vet Medicine VMC 700.08 Cliff Monahan (graduate students)	12
4/30/04	*	Ohio Contractors Association, Clark Street, Director	3
5/3/04	**	John Day/Rob Lane, Louisiana State University	2
5/3/04	*	ECLIPSE classes, Columbus Public School	22
5/3/04	*	ECLIPSE classes, Columbus Public School	22
5/4/04	*	EEOB 322 Introduction to Ornithology	13
5/4/04	*	LARCH 323 and LARCH 622 Landscape Architecture Brooks Breeden	45
5/4/04	*	ECLIPSE classes, Columbus Public School	22
5/4/04	*	ECLIPSE classes, Columbus Public School	22
5/5/04	*	EEOB 322 Introduction to Ornithology	13
5/5/04	*	ECLIPSE classes, Columbus Public School	22
5/5/04	*	ECLIPSE classes, Columbus Public School	22
5/5/04	*	Upper Arlington High School	25
5/5/04	*	Upper Arlington High School	25
5/5/04	*	Upper Arlington High School	25
5/5/04	*	Upper Arlington High School	25
5/5/04	*	Barb Thompson + 30 Columbus area teachers	31
5/5/04	**	Yvonne Baskin, Science Writer, Bozeman, MT	1
5/6/04	*	EEOB 322 Introduction to Ornithology	13
5/6/04	*	ECLIPSE classes, Columbus Public School	22
5/6/04	*	ECLIPSE classes, Columbus Public School	22
5/7/04	*	Civil Engineering Lecturer Dr. Bill Marcuson, Director Emeritus, Geotechnical Laboratory, USAE Waterways Experiment Station, Vicksburg, MS	4

5/7/04	*	School of Natural Resources transfer students field day	20
5/11/04	*	OSU-Mansfield/Korda Engineers	4
5/12/04	*	Keenagers: Jane Porter and Atonement Lutheran Church ladies,	15
5/13/04	**	John Teal and Susan Peterson, Rochester, MA	2
5/14/04	*	Environmental Geography 201 Dr. Bryan Mark	30
5/14/04	*	Environmental Geography 201 Dr. Bryan Mark	30
5/17/04	*	COSI Kim Whaley, Sarah Rogers	2
5/20/04	*	Geography H294 Global Climate Ellen Mosely-Thompson	10
5/21/04	*	Haward Butter	5
5/21/04	**	Robert Knight, Wetland Solutions, Gainesville, FL	1
5/22/04	*	Spring Marsh Mellow at the ORWRP	120
5/24/04	*	EEOB 210 Local Flora Elizabeth Harris	7
5/24/04	*	EEOB 210 Local Flora Elizabeth Harris	20
5/24/04	*	Wyandotte Run Elementary School (3rd grade)	51
5/26/04	**	Zhi Mao (Department of Irrigation and Drainage Eng, Wuhan University, China)	1
5/26/04	*	Susan Crowell, editor, Farm and Dairy magazine; Suzanne Steel, OSU extension	2
5/27/04	**	Dr. Jason Clay (World Wildlife Fund)/ Dr. Konrad Dabrowski (SNR)	2
5/27/04	*	Rebecca Wagner Appropriations Director (Mike DeWine Senator)	5
6/3/04	*	Stacy Raustaskas, Director Washington Office	3
6/4/04	*	Veterinary Biology Sci. Staff, Steve Weisbroke	10
6/12/04	*	Ohio Environmental Council	2
6/23/04	*	Columbus Public Schools (Ted Delleshy)	30
6/23/04	*	Columbus Public Schools (Ted Delleshy)	30
6/23/04	*	Columbus Public Schools (Ted Delleshy)	30
6/28/04	**	David Kovacic (Associate Professor, University of Illinois at Urban-Champaign)	1
6/30/04	*	(students, Tunia Bebee)	20
6/30/04	*	(students, Tunia Bebee)	20
7/7/04	*	Upper Arlington Newspaper writer	2
7/8/04	**	Dr. Margaret Greenway, Griffith University, Brisbane, Australia	1
7/8/04	*	OSU- Science Education	6
7/12/04	*	Moonlight on the marsh lecture Margaret Greenway	50
7/13/04	*	Wellington school	6
7/15/04	*	Camp Recky (6-12 years old)	20
7/15/04	*	Camp Recky (6-12 years old)	20
7/16/04	*	Geography 210 (Physical Geography and Environmental Issues)	30
7/23/04	*	Barber Roselea Center (Betty Leitzen)	13
7/26/04	*	Pickaway County Farmers (Mike Estep)	20
7/26/04	*	SNR Orientation	6
7/27/04	*	Vet Medicine Cliff Monahan	12
8/5/04	*	Ohio's Martin W. Essex School for the Gifted	25
8/5/04	*	Ohio's Martin W. Essex School for the Gifted	25
8/7/04	*	Columbus Horticultural Society	4
8/11/04	*	River Restoration short course	13
8/13/04	*	USDA Faculty Exchange Scholar (scholars from Uzbekistan and Ukraine)	4
8/13/04	*	Introduction to Biology (course coordinators)	4
8/18/04	**	Dr. Mucai Muchiri, Kenya	1
8/27/04	*	Sarha Blake and her husband (from Seattle, WA)	2
8/30/04	*	Wetland Delineation short course 2004	23
9/2/04	*	Vet Medicine VMC 700.05 Cliff Monahan	12
9/3/04	*	Abigail Hines (Science Fair student)	1
9/3/04	*	2 Visitors from Development Office	2
9/9/04	*	Ohio Aggregates and six others (Karen)	7
9/16/04	*	Wexner Center tour (Shelly Casto)	23
9/19/04	*	OSU Alummi Association Inc. (Jeff Nielsen)	10
9/23/04	*	Capital University (Ecology)	10
9/28/04	*	NR 725 Wetland Ecology and Management	33
9/28/04	*	Conservation Biology (EEOB 661)	30
9/28/04	**	Nicole Cavarder (Restoration Ecologist)	1
10/7/04	*	Wexner Center (Artists Alexis Rockman, Susan Dackerman, Sherly Casco, Dorothy Spears)	4
10/7/04	*	Upper Arlington High School (Beth Darley)	25
10/7/04	*	Upper Arlington High School (Beth Darley)	25
10/7/04	*	Conservation Biology (EEOB 661)	30

10/11/04	*	Pat Oppor (potential Grads)	1
10/12/04	*	Tour (Tim Homan, Director of Philanthropy, The Nature Conservancy of Ohio)	1
10/12/04	*	Cara Boscoe (potential grad student from Michigan)	1
10/12/04	*	Chinese Artists (Deng, Xiu)	2
10/12/04	*	Middle School	9
10/13/04	*	NR 626 Fisheries Technique (Lance Williams)	7
10/14/04	*	Jane Harf and John Hollback, American Electric Power	2
10/14/04	*	Blacklick Woods Metro Park (contact: Beverly Ratliff)	3
10/18/04	*	FAES 100T Natural Resources Survey (Mark Giese)	23
10/19/04	*	4 people (3 from Germany, 1 from Ohio)	4
10/21/04	*	Allan Crowe, National Water Research Institute, Burlington, Ontario, Canada	1
10/21/04	*	Tremont Elementary (Fourth Grade, Dorene Henschen)	20
10/22/04		OSU Honors Day, East Ballroom, Ohio Union (Nina Hoppes)	
10/28/04	*	EDU/TNL 894	20
10/29/04	*	Hannah Ashton Middle School Reynoldsburg (5+6 grade, Tracy Grimes)	25
10/29/04	*	Hannah Ashton Middle School Reynoldsburg (5+6 grade, Tracy Grimes)	25
10/29/04	**	Pete Loucks, Professor of Civil Engineering, Cornell University	1
11/1/04	*	Faculty Club, University Woman's Club	80
11/3/04	*	Freshman Field Day (SNR, Trish Raridan Preston	12
11/5/04		OSU Honors Day, East Ballroom, Ohio Union (Nina Hoppes)	40
11/5/04	*	Tour for Ag Admin Society Meeting	15
11/5/04	*	Abbey and Gabriele Silverstone, Arroyo Grande, CA (5 participants)	5
11/8/04	*	Ruth Smart, Bobbi Riedel	2
11/8/04	*	Barbara and Jim Sipp Family, Paul Sipp, Brian Hastings, President's Club	4
11/10/04	*	Mort Javadi, Environmental Technology Science class, Columbus States	6
11/10/04	*	Mierle Laderman Ukeles, Bronx, NY (Wexner Museum environmental art guest)	1
11/13/04	*	Freshman Field Day (SNR, Trish Raridan Preston)	25
11/13/04	*	Freshman Field Day (SNR, Trish Raridan Preston)	25
11/15/04	*	SNR class	15
11/16/04	*	FAES College Marilyn Trefz from local high schools	45
11/17/04	*	Larry Bell, ICS Inc., Marion, OH	1
11/17/04	*	Jerome Tiniamow, Executive Director, Audubon Ohio	4
11/19/04	**	Gary Pierzynski, Kansas State University, and Nick Basta, SNR	2
11/19/04	*	Natalie Pausch, Ben Shepherd, Sherman Oaks, CA	3
11/19/04	*	ORW Advisory Committee Meeting	14
11/19/04	*	SNR	4
11/19/04	*	Wayne and Linda Struble, Arlington, VA w/ Dick Stoddard	3
11/24/04	*	Norah Zuniga Shaw, Dance Department, OSU	2
12/7/04	*	Joel R. Gat, Dept. Environmental Sciences, Weizman Institute of Science, Rehovot, Israel	1
12/10/04	*	Tom Hetherington EEOB, OSU; Jennifer Sander, Lee University	2
12/13/04	*	Marshal Eames, Depaul University, Chicago	1
		TOTAL	2336
		# of Tours/Presentations	160

*site tour

**site tour with visiting scientist or distinguished visitor

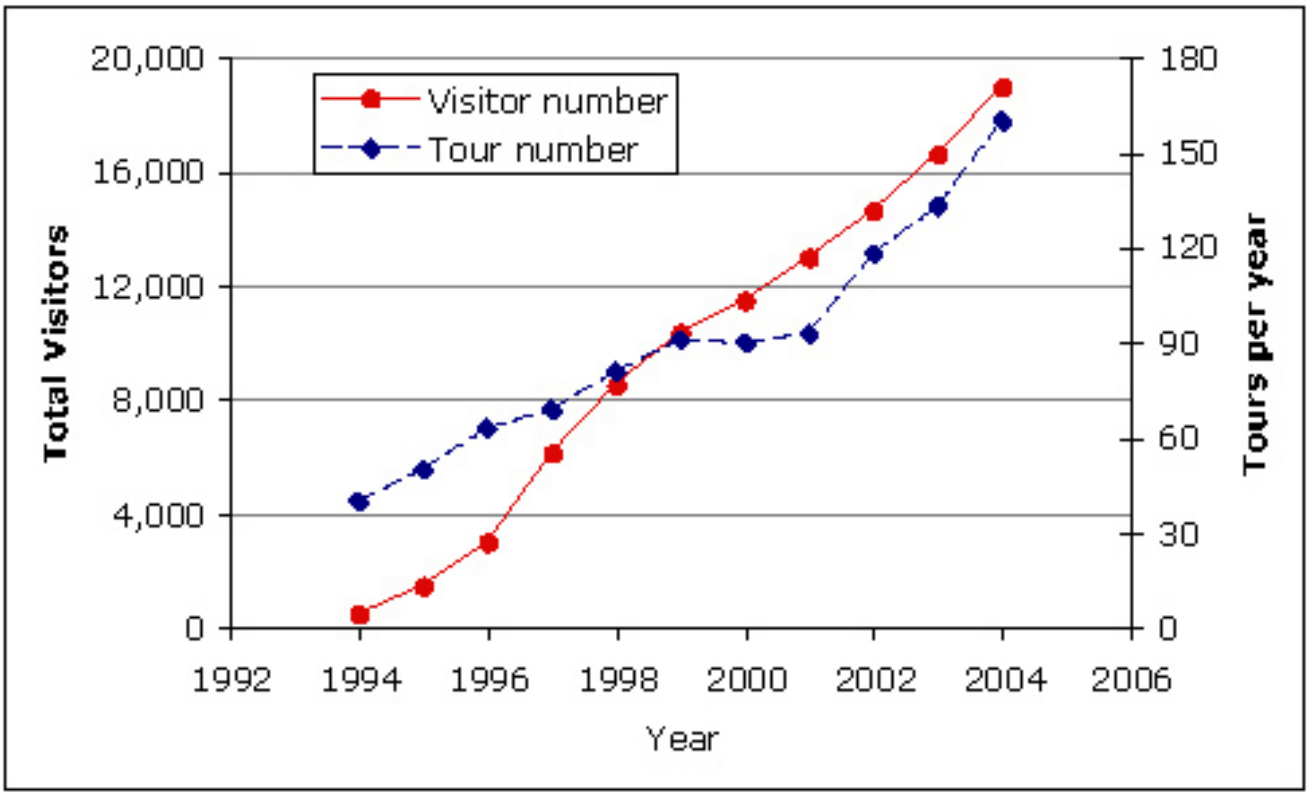

Figure 10. Number of wetland tours/presentations of ORWRP and cumulative number of participants, 1994-2004.

Table 5. Publications and theses supported at the Olentangy River Wetland Research Park in 2004

Papers

04-006 Fink, D.F. and W.J. Mitsch. 2004. Seasonal and storm event nutrient removal by a created wetland in an agricultural watershed. Ecological Engineering 23:313-325.

04-005 Mitsch, W.J., N. Wang, L. Zhang, R. Deal, X. Wu and A. Zuwerink. 2005. Using ecological indicators in a whole-ecosystem wetland experiment. In S.E. Jørgensen, F-L Xu, and R. Costanza, eds. Handbook of Ecological Indicators for Assessment of Ecosystem Health, CRC Press, Boca Raton, FL. pp. 211-236.

04-004 Gutrich, J.J. and F.J. Hitzhusen. 2004. Assessing the substitutability of mitigation wetlands for natural sites: Estimating restoration lag costs of wetland mitigation. Ecological Economics 48: 409-424.

04-003 Zhang, L., and W.J. Mitsch. 2005. Modelling of hydrological budgets of flow-through created wetlands: An integrated system approach. Environmental Software & Modelling. 20: 935-946.

04-002 Mitsch, W.J. and J.W. Day, Jr. 2004. Thinking big with whole ecosystem studies and ecosystem restoration: A legacy of H.T. Odum. Ecological Modelling 178: 133-155.

04-001 Selbo, S.M. and A.A. Snow. 2004. The potential for hydridization between Typha angustifolia and T. latafolia in a constructed wetland. Aquatic Botany 78: 361-369.

Theses/Dissertations

Lohan, E. 2004. A methodology to ecologically engineer watersheds for nitrogen nonpoint source pollution control" Environmental Science Graduate Program, The Ohio State University.

Porej, D. 2004. Faunal aspects of wetland creation and restoration" Ph.D. dissertation, Evolution, Ecology, and Organismal Biology, The Ohio State University.

Table 6. Press and media coverage of the Olentangy River Wetland Research Park, 2004

Date	Article Title or Event	Publication
January 20, 2004	"Leave flood plains free of development"	The Columbus Dispatch
February 14, 2004	"Huge conference focuses on eco-technology in Taiwan	Taipei Times
March 22, 2004	"Ohio State wetlands professor wins prestigious water prize"	Ohio State Research News
April 8, 2004	"Wetlands professor wins prestigious Water Prize"	On Campus
April 22, 2004	"Wetlands harbor research"	The Lantern
April 27, 2004	"Wetlands regaining lost ground'	The Columbus Dispatch
June, 2004	"Meet the 2004 Stockholm Water Prize Laureates"	Stockholm Water Front
June 10, 2004	"Expertos en ingeniería ecológica en el Aula Dei"	el Periódico de Aragón
July 19, 2004	"Created wetlands spawn debate"	The Columbus Dispatch
July 21, 2004	"Wetland Heaven: Mitsch's efforts at OSU's living laboratory" consistently draw international accolades"	Upper Arlington News
July 29, 2004	"Award winning professor wetlands expert: Bill Mitsch engineered OSU wetlands, says much more in ecology's future"	The Lantern
December 10, 2004	"Cream of the crop: Columbus architects' group gives nod to six designs in annual contest	The Columbus Dispatch

Publications

There were 6 peer-reviewed papers, several technical reports, and 2 theses/dissertations added to the ORWRP reprint collection in 2004 (Table 5).

Wetland Short Courses

Three short courses were taught in 2004 in the wetland program. One course was taught in Naples, Florida (Figure 11 top). The other two courses—wetland delineation and river restoration—were taught in the conference room in the Heffner Wetland Research and Education Building and at local wetlands (Figure 11 bottom). The courses attracted 45 students from 17 states. Participants were primarily from environmental consulting firms and state and Federal agencies and they indicated high satisfaction with the content and locations of the courses.

Publicity

The Olentangy River Wetland Research Park and its research and teaching were publicized more than a dozen times during 2004 in newspaper articles and other publications (Table 6). In addition, the 2004 Stockholm Water Prize award (Figure 12) announcement was covered by an Associate Press story that appeared in several dozen major newspapers nationwide. Several hundred congratulatory notes are on the web at: *http://swamp.osu.edu/Stockholm_Water_Prize_2004/SWP%20Congratulations.html* and details of the award are at *http://www.siwi.org/press/presrel_04_WWW%20SWP.html*

Copies of some of the press articles related to ORWRP activities in 2004 are given in the Appendix.

Development

The Olentangy River Wetland Research Park has been supported in its 14 years of development (1991-2004) by thousands of private donations to the University. Through December 2004, over $3.9 million in cash and in-kind support has been raised for the wetland project (Table 7; Figure 13), almost all from corporations and individuals. In 2004, there were 332 donations totaling $1,689,049, the highest total for any year for both categories. In 2003, donations were $361,000 while they were $365,000 in 2002. The major donation in 2004 was a generous donation of $1,518,536 from the estate of Wilma H. Schiermeier for an endowment of the Olentangy River Wetland Research Park.

Over the years, about 15% of the ORW donations (equivalent to $593,000) received at the ORWRP have been as in-kind contributions. In-kind support obtained over the years includes donation of 4.9 acres of land on the southeastern corner of the ORWRP adjacent to river (value of $75,000), two four-wheel drive vehicles, construction of the billabong wetland, groundwork and gravel for the new building, a paved driveway (Heffner/Agg Rok), and civil engineering for building construction (Bischoff Miller Inc.). The cost of the building after bids was determined to be approximately $2.8 million. By the end of 2004, most of the money had been raised or pledged for the building and most of a $330,000 loan from OARDC for the building has been paid back through 2004.

The Master Plan

The site master plan for the Olentangy River Wetland Research Park as originally designed in 1991 is essentially complete (see Figure 2). Plans are underway to construct a bikepath shelter on the city bikepath that cuts through

Figure 11. The Olentangy River Wetland Research Park held 3 short courses in 2004, with a total of 45 participants from 17 states and provinces. Top: Robin Lewis discusses mangrove swamp restoration in Naples, Florida, April 2004. Bottom: Andy Ward leads discussion on stream and river restoration in Columbus, August 2004.

Figure 12. Stockholm Water Prize Ceremony, August 19, 2004, Stockholm, Sweden. Top. Bill Mitsch, Sven Jørgensen, His Majesty Carl XVI Gustaf, SWP Nominating Committee Chair Harald Rosenthal, Kiel University, Germany. Bottom: Ceremony in Blue Hall, Stockholm City Hall.

Table 7. Donation support for the Olentangy River Wetland Research Park through 2004.

Year	Number of donations	Total amount of donations	In-kind donations*	Endowment donations	Non-building donations**	Building fund
2004	332	$1,689,049	0	$1,518,536	$148,306	$22,207
2003	289	$361,569	$71,403	$50,956	$108,687	$130,523
2002	264	$365,056	$80,510	$ 445	$20,143	$263,933
2001	319	$248,416	$75,000	$1,140	$9,984	$162,292
2000	250	$237,077	$31,300	$97,620	$22,129	$86,028
1999	165	$115,626	$3,705	$94,000	$6,782	$11,138
1998	149	$98,839	$23,624	$4,415	$63,360	$7439
1997	168	$78,228	$13,503	$300	$61,215	$3,213
1996	146	$221,889	$187,78	$4,000	$30,105	
1995	108	$97,184	$36,516	$11,000	$49,668	
1994	86	$62,686	$48,744		$13,942	
1993	46	$259,206	$21,215		$237,991	
1992	7	$59,347	$6,327		$53,020	
TOTAL	2330	$3,894,170	$592,980	$1,782,437	$831,982	$686,771

* In-kind includes construction of 7-acre billabong in 1996 ($170,000), donation of 5 acres of bottomland forest in 2001 ($75,000), earthwork and gravel for building construction (2002-03), paved driveway (2003), and civil engineering for building (2003)

** Includes construction of wetlands in 1992-95 ($330,000), Sandefur Wetland Pavilion in 1997-98 ($100,000), bikepath and signage in 2003 ($50,000) and instrumentation required with donations in 2002-03 ($70,000).

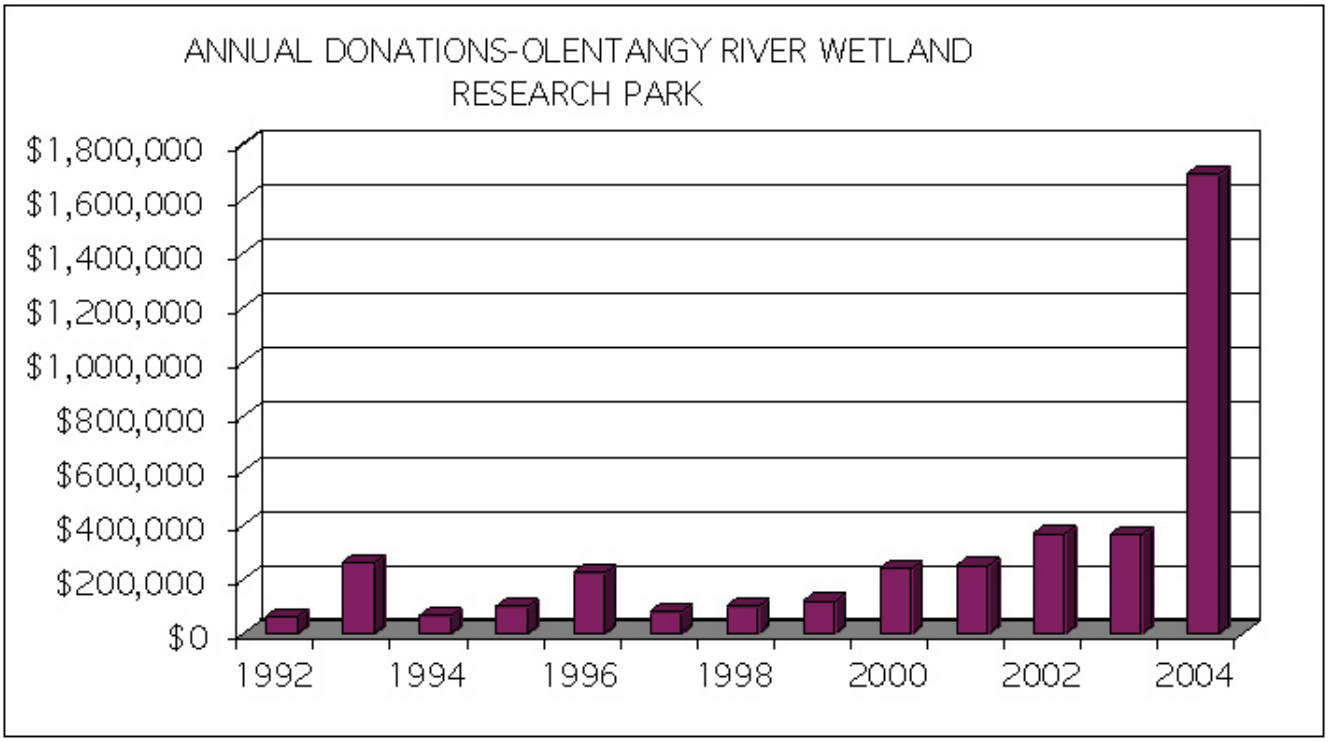

Figure 13. Total development support for Olentangy River Wetland Research Park, 1992-2004.

the ORWRP (Figure 14). The facility, to be constructed in 2006, will have solar collectors on the roof for supplying power to displays related to the wetlands.

ORWRP's Impact

Through 2004, the economic and academic impacts of the ORWRP on Ohio State University and the world of wetland science have been significant. Over its development and operation, the ORWRP has resulted in the following economic advantages to the University:

Wetland Short Course Fees	$200,000
Extramural Grants and Contracts	$3,000,000
Donations	$4,000,000
Total impact	$7,200,000

Over the period 1992-2004, the project has also been responsible for the following academic achievements that cannot always be assigned economic value:

• completion of 44 undergraduate and graduate student theses and dissertations at OSU, including 5 from European institutions;

• publication of 115 papers listed in the ORWRP reprint series,

• completion of 13 comprehensive annual reports summarizing all research accomplished at the ORWRP,

• leadership of over 900 formal wetland tours and presentations for the public to an estimated 19,000 individuals, including K-12 students, university students, garden clubs, campus visitors, and Federal, state, and local public officials.

• provision of a convenient set of campus ecosystems in support of over 180 Ohio State University classes in 7 university colleges and several courses from other Ohio institutions.

• provision of a controlled research site for more than 100 students doing independent research for theses and dissertations. The ORWRP has supported the research and teaching programs of more than 40 OSU professors and senior researchers from 7 OSU Colleges and scientists from other Ohio institutions.

• education of 275 agency personnel, consultants, and students in 17 wetland short courses taught since 1996.

• development of the fields of wetland science and ecological engineering to the point where they have led to a significant improvement in Ohio's and the nation's environment.

References

Mississippi River/ Gulf of Mexico Watershed Nutrient Task Force. 2001. Action plan for reducing, mitigating, and controlling hypoxia in the northern Gulf of Mexico. Report submitted to U.S. Congress, U.S. Environmental Protection Agency, Washington, DC.

Mitsch, W.J., J. W. Day, Jr., J. W. Gilliam, P. M. Groffman, D. L. Hey, G. W. Randall, and N. Wang. 2001. Reducing nitrogen loading to the Gulf of Mexico from the Mississippi River Basin: Strategies to counter a persistent large-scale ecological problem. BioScience 51: 373-388.

Mitsch, W.J., L. Zhang, and A. Altor, eds. 2005. Schiermeier Olentangy River Wetland Research Park at The Ohio State University, Annual Report 2004. The Ohio State University.

Figure 14. Sketch of AEP Olentangy River wetland bikepath shelter planned for city bikepath through Olentangy River Wetland Research Park.